A Study of the Scope of Practice of Military Nurse Anesthetists

A thesis submitted in partial fulfillment of the requirements for the degree of
Master of Science in Nurse Anesthesia
at Virginia Commonwealth University

By

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Abstract

A STUDY OF THE SCOPE OF PRACTICE OF MILITARY NURSE ANESTHETISTS

By Steven Price Eby, B.A., B.S.N.

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Nurse Anesthesia at Virginia Commonwealth University.

Virginia Commonwealth University, 1996

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Anecdotal statements by military nurse anesthetists have claimed a greater scope of practice than their civilian counterparts. There is no systematically obtained data in the literature to refute or support this claim. This study sought through a descriptive correlational design to describe the scope of practice of active duty military nurse anesthetists within the United States Army, Navy, Air Force and Public Health Service and determine if there were any differences in practice among these services. A survey was sent to 30 % of active duty nurse anesthetists living within the United States. The demographic subjects surveyed included branch of service, age, gender, anesthesia care team make-up, size of facility, years of anesthesia practice and years of active duty

anesthesia practice. Areas of practice surveyed included the age, ASA classification and urgency of cases, independence in pre-operative evaluation, induction, maintenance, emergence and post-operative evaluation; and independence in the performance of airway management procedures, regional anesthetics and central line procedures. The data indicated no significant demographic differences among the services. Analysis indicated significant differences among the branches in the areas of independence of practice and regional techniques. A greater number of significant differences appeared when the data was reanalyzed according to facility size. Though this study did not attempt to systematically contrast military with civilian practice, comparisons with data from earlier studies indicated that military anesthetists performed fewer cases on a younger, healthier patient population than civilians. A greater percentage of military anesthetists were performing regional anesthesia and line placement than civilian anesthetists.

Chapter One

Introduction

Many military nurse anesthetists claim a broader scope of practice than their civilian counterparts. They report a greater independence in practice, including the planning and implementation of procedures such as regional anesthesia and invasive line placement. Such procedures are frequently performed by anesthesiologists in the civilian sector. Though many military anesthetists make these claims, there has to date been no systematic study of their scope of practice.

A number of studies in the past two decades have examined the practice of nurse anesthetists in the United States. Maziarski (1979) surveyed the practice patterns of nurse anesthetists with a focus on work milieu, areas of responsibility, continuing education, training, and type of practice. In 1985, the American Association of Nurse Anesthetists (AANA) in its annual membership survey reported percentages of anesthetists performing regional anesthesia by employment setting and the type and availability of supervision. Lester and Thomson, and Rosenbach and Cromwell (1989) surveyed the practice patterns of both nurse and physician anesthesia providers. In 1992, the Council on Certification of Nurse Anesthetists completed an extensive survey of nurse anesthetists' professional practice in order to gather data to revise the certification exam (Zaglaniczny, 1993). Garde (1994) reviewed the demographics of anesthesia practice obtained from the Fiscal Year 1994 AANA Membership Survey. Fassett and Calmes (1995) studied the perceptions nurse anesthetists and anesthesiologists on the need for medical direction.

None of these investigations specifically differentiated between military and civilian practice patterns.

The military has been using nurse anesthetists since World War I. During the second World War, the first military nurse anesthesia program was created by the U.S. Army. By the Vietnam War, the Army, Navy and Air Force each operated nurse anesthesia education programs (Gunn, 1991). Bullard (1991) stated that the military, in general, had unique goals for nurse anesthesia education and that the United States Air Force (USAF), in particular, needed nurse anesthetists with the ability "to function independently with a minimum degree of physician supervision" due to the large number of small facilities without anesthesiologists.

The scope of practice of military anesthetists is worth studying for several reasons. First, utilization of nurse anesthetists is important from the standpoint of cost. In the current atmosphere of health care reform and cost containment, data on personnel utilization are increasingly important. If significant differences in scope of practice exist, then an examination of the cost differences may be in order. Second, data demonstrating an expanded scope of practice may be useful to those considering service as an anesthesia provider in the military. Third, data on expanded practice can be helpful to those that need to demonstrate the capabilities of nurse anesthetists to policy makers.

Purpose of the Study

The purpose of this investigation is: (a) to explore systematically the scope of practice of military nurse anesthetists on active duty with the United States Air Force, Army, Navy and Public Health Service; (b) to identify differences in the practice patterns of nurse anesthetists among the uniformed services and (c) to establish a foundation of data for a future comparison to civilian nurse anesthetists.

Statement of the Problem

Military nurse anesthesia practice is an unexplored area. How independently military nurse anesthetists practice, their patient population, the procedures they perform, and their work settings are examples of areas that lack systematic study. Questions this study seeks to answer are: (a) What is the scope of practice of active duty military nurse anesthetists? (b) Are there significant differences in the planning, implementation and evaluation of anesthesia among the uniformed services utilizing nurse anesthetists? (c) How independent are military nurse anesthetists in their anesthesia practice? (d) If differences in independence of practice exist among the uniformed services, does greater independence come at the cost of doing less complicated cases? (e) Are complex procedures performed by an anesthesiologist or a nurse anesthetist in the military setting?

Hypothesis

There are no differences in the scope of practice of active duty military nurse anesthetists among the uniformed services.

Variables

A number of variables must be investigated to evaluate differences in scope of practice. The independent variable is the branch of the uniformed services in which a nurse anesthetist is on active duty. Associated co-variables are years of anesthesia practice, age, gender, years of active duty anesthesia practice, number of anesthetists and anesthesiologists in a work setting and facility size. Dependent variables include number of anesthetics administered, frequency of use of anesthetic techniques and procedures, percentage of elective and emergency cases, percentage of cases by American Society of Anesthesiologists (ASA) physical status classification, percentage of cases by age of

patient, and independent or team approach to pre-op assessment, intra-operative management, and postoperative evaluation.

Definition of terms

Scope of practice. Scope of practice is an outline of the activities a licensed nurse may legally perform when caring for patients as defined by each state's nurse practice act. An institution further regulates scope of practice within the bounds of the nurse practice act through policy and procedure manuals specific to the institution. (Catalano, 1994).

Certified Registered Nurse Anesthetist (CRNA). A Certified Registered Nurse Anesthetist is a licensed registered nurse who has graduated from an accredited nurse anesthesia program and successfully completed the certification exam administered by the AANA Council of Certification or one of its predecessors and who complies with the criteria for biennial recertification set by the AANA Council on Recertification (AANA, 1992).

Anesthesiologist (MDA). An anesthesiologist is a licensed medical doctor who has successfully completed residency in anesthesiology.

Active duty military. Commissioned persons serving on orders for full time extended duty in U.S. Army, Air Force, Navy or Commissioned Officer Corps of the Public Health Service are on active duty.

Pay grade. Pay grade is a numerical scale that consistently represents equivalent ranks across the uniformed services.

Civilian. A person not presently serving in the military on active duty status is a civilian.

Elective. A scheduled, non-emergent case is elective.

Emergency. A case requiring expedited intervention due to acute disease or trauma is an emergency.

ASA physical status classification. The ASA physical status classification system categorizes patients according to their health status. An ASA I patient is a normal healthy person. ASA II describes a patient with mild systemic disease. ASA III patients have severe systemic disease that limits activity. ASA IV describes a patient with an incapacitating disease that is a constant threat to life. ASA V classifies a moribund patient not expected to live more than 24 hours (Barash, Cullen & Stoelting, 1992).

Induction. Induction is period of transition from an awake, conscious patient with intact protective reflexes to an unconscious patient (Davison, Eckhardt & Perese, 1993).

Maintenance. Maintenance is the interval of time starting when the patient is at an adequate level of anesthesia for the start of surgery and continuing until anesthesia is no longer necessary (Davison et al., 1993).

Emergence. Emergence is the transition from unconscious to awake state in which protective reflexes return (Davison et al., 1993).

Assumptions

Inherent in the study are four assumptions:

(1) The names supplied by the AANA are those of active duty military nurse anesthetists.

(2) Persons surveyed will complete and return the survey.

(3) Persons surveyed will answer the questions honestly.

(4) The answers provided by survey respondents will accurately reflect their practice.

Limitations

The limitations affecting the study are:

(1) The quality of the data gathered depends on the return rate of surveys.

(2) Recipients are asked to recall information based on their best judgment without consulting records. The fact that they are asked to recall information as opposed to recording data as events occur adds a subjective component to the study. Recall of events is more likely to be influenced by personal bias.

(3) The study does not include military anesthetists serving in overseas locations. Anesthetists serving in remote overseas locations may practice more independently than those in facilities within the United States.

(4) The study examines practice during peacetime. Scope of practice may differ significantly when military anesthetists are operating during a wartime environment.

Delimitations

The population of nurse anesthetists exceeds 26,000. Of this population approximately 551 are active duty military. Although it is possible within the constraints of the study to survey a representative sample of military anesthetists, it is not possible to survey an equally representative sample of civilian anesthetists. Civilian nurse anesthetists work in a variety of locations: hospitals; CRNA/MDA groups; CRNA groups; private practice; offices; clinics; and freestanding ambulatory surgery centers. This increases the heterogeneity of the population which increases the difficulty of obtaining a representative sample. For this reason, the survey was limited to military nurse anesthetists.

Conceptual Framework

Scope of practice of nurse anesthetists encompasses the professional functions, privileges, and responsibilities associated with nurse anesthesia practice (AANA, 1992). In its Guidelines and Standards for Nurse Anesthesia Practice, the AANA outlines the functions of nurse anesthetists:

(1) Preanesthetic assessment and evaluation of the patient, including requesting consults and diagnostic tests, ordering and administering pre-op medications and fluids and obtaining informed consent.

(2) Developing and implementing an anesthetic plan.

(3) Initiating the planned anesthetic technique including general, regional, local and IV sedation.

(4) Selection and administration of anesthetics, adjuvant drugs, accessory drugs and fluids necessary to maintain homeostasis and correct abnormal responses to anesthesia or surgery.

(5) Selection and placement of appropriate invasive and non-invasive monitors for collecting and interpreting patient physiologic data.

(6) Airway and pulmonary status management including endotracheal intubation, mechanical ventilation, pharmacologic support, respiratory therapy and extubation.

(7) Managing emergence and recovery from anesthesia.

(8) Releasing and discharging patients from post-anesthesia care areas, and providing post-anesthesia evaluation and care.

(9) Ordering and administering pain therapy through utilization of drugs, regional anesthesia and other accepted pain relief modalities.

(10) Response to emergency situations by providing airway medications, and fluid management, and basic or advanced cardiac life support techniques.

(11) Additional nurse anesthesia responsibilities within the expertise of the individual CRNA.

The legal boundaries of nurse anesthesia practice are set by state regulations. All fifty states address the practice of nurse anesthetists in at least one statute or regulation (Tobin, 1994). Most states define nurse anesthesia scope of practice in the Nurse Practice Act and/or State Board of Nursing Rules and Regulations. Tobin reports that every state permits nurse anesthetists to administer local, regional and general anesthesia and do not prohibit nurse anesthetists from engaging in the common anesthesia practices they were educated to perform. Fourteen states require supervision of nurse anesthetists by a physician, though none require the physician to be an anesthesiologist (Jenny & Shotten, 1991). Supervision does not necessarily require the physical presence of a physician in the operating room; although some states do require the presence of a physician in the operating room or within the surgical or obstetrical suite.

Scope of practice is further regulated by the institution or organization in which the anesthetist practices anesthesia. Institutions or organizations can set their own policies and procedures for anesthesia practice within the bounds of state regulations. An example of an organizational policy regarding nurse anesthesia scope of practice is Air Force Instruction 44-102, Section F, Paragraph 1.16.4 of Anesthesia Policy and Practice (1995), which states:

Appropriately privileged Certified Registered Nurse Anesthetists (CRNA) may routinely administer anesthesia to:

- Children two years and older.

- Patients in American Society of Anesthesiology (ASA) classification II or lower risk.

Exception: CRNAs may administer anesthesia to patients younger than 2 years old or with higher risk than ASA classification II after verbal consultation with the individual's anesthesia consultant and document the results of this consultation in the patient's record.

Unless the exception is more common than the rule, a policy like this clearly limits the complexity of cases available to Air Force nurse anesthetists.

This same Air Force Instruction states:

3.22.1. Anesthesiologists:

- Determine which anesthetic agents to use.
- Record their findings on SF 517**, Clinical Record-Anesthesia.**

Exception: When an anesthesiologist is not available, the CRNA determines the anesthetic agents.

Again, the independence of the nurse anesthetist seems constrained by the policy. Regarding prescriptive authority, the instruction gives nurse anesthetists and anesthesiologists equal authority in writing pre-operative orders.

The practice of the Air Force nurse anesthetist is further regulated at the hospital level. Hospital regulations are more specific in their guidelines. SGOSA Operating Instruction 160 - 12 (1995) of the 1st Medical Group at Langley AFB hospital describes the duties and responsibilities of the staff nurse anesthetist. The nurse anesthetist "administers anesthetic agents in accordance with professional guidelines, executes patient care in

accordance with AF policies and regulations, JCAHO standards, and AANA guidelines for Nurse Anesthetists," and "canulates arteries and veins, places invasive catheters, endotracheal tubes, and attaches all state of the art anesthesia monitors during anesthesia and resuscitation procedures." This instruction stipulates which other regulations apply to the anesthetist, and specifically lists procedures that the anesthetist may perform.

Summary

No systematic study of military nurse anesthesia practice has been attempted to substantiate the claims of some military nurse anesthetists that they enjoy a wider scope of practice than their civilian counterparts. The purpose of this study is to systematically obtain data on the scope of practice of military anesthetists by surveying the type and complexity of cases managed, degree of supervision, and procedures performed. With this data, differences in scope of practice among the uniformed services can be explored and a basis for future comparison with civilian nurse anesthetists can be established. Limitations that impact the generalizability of the results include the survey response rate, and possible influence of bias on the survey results, the fact that anesthetists in overseas locations are excluded and the fact that practice during a war is not examined.

Chapter Two

Review of Literature

Overview of Nurse Anesthesia Practice

In 1977, the Council on Nurse Anesthesia Practice conducted a survey of all active members of the American Association of Nurse Anesthetists including military members and members employed overseas (Maziarski, 1979). The survey explored type of work setting, size of hospital, call experience, criteria for assigning cases, expected professional responsibilities, types of procedures performed, ASA classification of patients, and other educational and professional aspects of nurse anesthesia practice. Respondents were divided into two categories: Staff and Chief/Sole anesthetist. The survey found that 67.5% of respondents worked in a hospital setting with responsibility over cases involving all ASA classifications. More than 80% of cases were general anesthetics. Professional responsibilities differed between Staff and Chief/Sole anesthetists. Fifty-five percent of staff anesthetists were responsible for writing pre-op notes, as opposed to 75% of Chief/Sole anesthetists. Twenty-eight percent of Staff and 42.5% of Chief/Sole, did not write pre-op medication orders. In most cases, 90.6% of Staff, and 96.0% of Chief/Sole, anesthetists chose the anesthetic agents used. The majority of both categories of anesthetists wrote post-op follow-up notes.

The major limitations of this survey were a low response rate of 41.7% and a lack of references. The response rate decreased the generalizability of the data. The lack of references complicated the interpretation of the data. The study made no differentiation between military and civilian nurse anesthetists.

The AANA (1985) published data from its annual membership survey pertinent to anesthesia practice. The survey sought information on demographics, employment setting, types of shifts worked, hours worked, number of anesthetics administered by employment setting, liability insurance, supervision, and regional anesthetics administered. The report categorized some data according to employment setting, which allowed differentiation between military and civilian settings. Mean number of anesthetics administered annually by military anesthetists was 478 compared to 610 for the entire response group. Military anesthetists delivered the most regional anesthetics by work setting. One hundred percent administered spinal and axillary blocks. Eighty percent administered Bier blocks. Only in peribulbar and retrobulbar did any other work setting score higher than the military in the percentage of anesthetists performing blocks. Military anesthetists exceeded the total percentage of respondents administering blocks in all but the retrobulbar group.

The availability of supervision was studied but not reported according to work setting. Supervision was available in the operating room or operating suite for 87.6% of the respondents.

This survey provided a glimpse at practice differences between military and civilian nurse anesthetists. Strengths of the survey were its sample size -- the 20,347 members of the AANA at that time and a response rate of 82.9%. The usefulness of the data was limited by the fact that it is now over a decade old and that the survey was not designed to differentiate between military and civilian practice patterns. Only a small amount of the data was reported in a way that made differentiation possible.

Practice Patterns of Nurse Anesthetists and Anesthesiologists

Lester and Thomson (1989) surveyed the practice patterns of both nurse anesthetists and physician anesthesiologists. Much of their survey focused on demographics such as age, gender, years in practice; however, some data pertinent to scope of practice was obtained. Twenty-one percent of nurse anesthetists worked independently of an anesthesiologist. Nearly seven percent worked in a government hospital.

The major focus of the study was on future role statements and the differences in response rates between nurse anesthetists and anesthesiologists. Independent practice was an area of disagreement between nurse anesthetists and anesthesiologists. Surprisingly, the support among nurse anesthetists for independent practice was not strong. Strengths of the study were its use of random selection of subjects and sample size: over 350 in each group.

Anesthesia Practice Patterns and Provider Cost Differences

Also in 1989, Rosenbach and Cromwell studied demographics and practice patterns of nurse anesthetists and anesthesiologists in order to establish cost differences. They used information gathered in other studies and a survey of their own to establish demographics, and practice and cost data. Their data revealed 9.4% of nurse anesthetists working in Federal hospitals with approximately two-thirds of these working independently of an anesthesiologist. Task performance data indicated 51.1% of nurse anesthetists evaluated patient risk factors, 60.7% discussed the anesthesia care plan with the patient or family, 20.7% obtained informed consent, 45.1% evaluated patient in recovery, 29.3% performed regional anesthesia and 36.2% inserted arterial lines. Nurse anesthetists who worked independently were more likely to insert central lines or swan ganz catheters than those in

team settings, however, the independent practitioner was less likely to perform anesthesia for a complex case than the anesthetist in the team setting.

Rosenbach and Cromwell provided a broad view of anesthesia practice, but again no differentiation was made between military and civilian practice patterns. They introduced the subject of cost-effectiveness into the scope of practice issue and concluded that nurse anesthetists are a good substitute for anesthesiologists at a substantial savings. One limitation of their survey was the lack of a discussion about methodology. They mentioned that 500 nurse anesthetists and 500 anesthesiologists were surveyed, but do not present how the sample was selected or how many subjects responded. Without this information, it is difficult to judge the validity of their conclusions.

The Council on Certification of Nurse Anesthetists Professional Practice Analysis

The most extensive analysis of nurse anesthesia practice was completed in 1992 by the Council on Certification of Nurse Anesthetists (Zaglaniczny, 1993). Their Professional Practice Analysis surveyed all American Association of Nurse Anesthetist Board members, Council representatives, program directors (Select group) and practitioners with 1-2 years of experience (Practitioner group). A 60% return rate was obtained of the 1,432 surveys mailed. The survey obtained data on education, work location, experience, demographics, types of patients and ASA categories. It extensively surveyed frequency and expertise level of over 93 patient conditions and diagnostic data encountered. Seventy-four surgical and diagnostic procedures were evaluated. The survey examined 52 areas of the anesthesia process and 28 types of equipment.

The survey reported 8.1% of the Select group and 6.6% of the Practitioner group in Federal service but did not differentiate the practice analysis according to work location. Since the Council surveyed only the Select group and practitioners with only 1-2 years of

experience, a significant portion of the profession was not surveyed. For the purposes of the survey, this was not a flaw, but it diminished the generalizability of the data to all nurse anesthetists. The survey provided the strongest and most extensive means for analysis of scope of practice.

Recent Demographic Data

The 1994 AANA Membership Survey provided additional demographic data, but little information on practice patterns (Garde, 1994). Information on employment arrangement did not differentiate between hospital type except to divide them between hospital, university, and office, clinic or surgicenter. This survey provided the latest information on numbers of nurse anesthetists.

Anesthesia Care Team Practice Patterns

In 1995, Fassett and Calmes reported results of a prospective study of anesthesia care team practice in a 370 bed public teaching hospital. They devised an instrument to document what tasks were performed by nurse anesthetists and anesthesiologists. Both providers independently filled out data sheets describing their activities during each case over a four week period. The data indicated that a nurse anesthetist only prepared the equipment in 96% of cases, induced anesthesia in 80% of cases, maintained anesthesia in 85% of cases and managed emergence in 91% of the reported cases. Nurse anesthetists reported that medical direction was needed in 18% of cases compared to 24% by anesthesiologists.

This study provided information on how independently nurse anesthetists practice and what kinds of tasks they perform in one anesthesia care team. The strong point of the

study was its prospective design. The generalizability of the results was decreased because only one hospital was surveyed.

Summary

A review of the literature revealed no systematically obtained data specific to the scope of practice of military nurse anesthetists. Some of the studies provided glimpses of military practice; for example: Rosenbach and Cromwell's data revealed that two-thirds of nurse anesthetists working in Federal hospitals operate independently of anesthesiologists. The most pertinent data came from broad surveys such as the Professional Practice Analysis and the 1985 AANA Membership survey. Other studies provided information on anesthesia practice in general which could be useful as a background and for comparison to results of the current study. Questions that were not answered in the literature included how independently nurse anesthetists worked in the military, what kind and complexity of cases they were doing, what kinds of procedures they were doing currently and how this compared to their civilian counterparts.

Chapter Three

Methodology

The purpose of this investigation was: (a) to explore systematically the scope of practice of military nurse anesthetists on active duty with the United States Air Force, Army, Navy and Public Health Service; (b) to identify differences in the practice patterns of nurse anesthetists among the uniformed services; and, (c) to establish a foundation of data for a future comparison to civilian nurse anesthetists. The basic design of the study was descriptive correlational. Data were collected by survey to determine whether there was a relationship between branch of service, age, gender, anesthesia care team make-up, size of facility, years of anesthesia practice, years of active duty anesthesia practice and increased scope of practice. Areas of practice surveyed were type of cases by age, ASA classification, and urgency; independence in pre-operative evaluation, induction, maintenance, emergence and post-operative evaluation; and independence in the performance of airway management procedures, regional anesthetics and central line procedures.

Population and Sample

The population studied was all nurse anesthetists on active duty with the United States Air Force, Army, Navy and Public Health Service. A list of names and addresses of all active duty anesthetists was obtained from the AANA. This list totaled 551 persons. Excluding members with overseas addresses, the names were numbered sequentially and selected at random using a table of random numbers. Thirty percent of the anesthetists in

each branch were selected: 60 from the Army; 53 from the Air Force; 30 from the Navy; and 7 from the Public Health Service.

Data Collection

The author designed an original survey for the purpose of data collection. The survey was divided into two sections. In the first section, there were nine questions regarding branch of service, age, gender, anesthesia care team make-up, size of facility, years of anesthesia practice and years of active duty anesthesia practice, and three questions regarding the age, ASA classification and urgency of cases. In the second section there were nine questions regarding independence in pre-operative evaluation, induction, maintenance, emergence and post-operative evaluation; and independence in the performance of airway management procedures, regional anesthetics and central line procedures. These nine questions used a frequency scale derived from the survey used in the Professional Practice Analysis mentioned previously. Emphasized in the development of the survey was brevity and ease of completion in order to increase the response rate to the questionnaire. Most questions could be answered by marking a check box. The remainder of the questions required a short, fill-in-the-blank answer. The survey was four pages in length.

After determining the sample from the list provided by the AANA, the surveys, a cover letter explaining the purpose of the study and insuring the confidentiality of the responses, and a postage-paid return envelope were mailed to each member of the sample. Each return envelope was numbered in order to avoid sending a second mailing to survey respondents. The threshold for a second mailing was a response rate of less than 60%.

Reliability and Validity

To assure a valid instrument, the survey was reviewed and revised by a panel of experts in nurse anesthesia research and education. In addition, the survey was structured similarly to an existing instrument, the PPA, and uses a format and frequency scale similar to those used in that survey; however, no reliability and validity data were available for the PPA.

Statistical Analysis

Once the data was collected, the categorical data were tabulated, and frequency and percentage determined. To explore relationships, two way tables of frequencies were prepared, first by branch and second by facility size. Asymptotic chi-square values were used as a rough screen of relationships. If probabilities were less than or equal to 0.10 the tables were edited to remove missing data and reanalyzed using a Monte Carlo method. Means and standard deviations were calculated for age and number of cases. Group effects for these variables were explored by ANOVA and the Tukey HSD multiple comparison test.

Summary

No systematic study of the differences in scope of practice between military nurse anesthetists has been accomplished. This study sought through a descriptive correlational design to survey and describe the differences in scope of practice among the uniformed services. An original survey was created for the purposes of the study. It used a frequency scale similar to one used in the PPA. The planned analysis of the data included descriptive statistics as well as analysis of variance and asymptotic chi-square values. The data obtained should be useful to the profession as a whole by further describing nurse

anesthesia practice, useful to those considering a career as a military nurse anesthetist, and useful to those exploring the cost-effective use of nurse anesthetists.

Chapter Four

Results

Survey Response

Ninety-two of 150 surveys were returned for a response rate of 61.3%. Of the four branches of service, the Public Health Service had the highest response rate: 100%, while the other three uniformed services varied around 60%. Since the response to the first mailing exceeded the 60% threshold, a second mailing was deemed unnecessary. The response by branch is displayed in Table 1.

Table 1

Response Rate by Branch of Service

	Branch of Service				
	Navy	Army	Air Force	Public Health	Total
Surveyed	30	60	53	7	150
Response	19	35	31	7	92
Percent	63.33%	58.33%	58.49%	100.00%	61.33%

Year of Active Duty Military Service

Respondents were asked the number of years they had served on active duty as a nurse anesthetist. Possible answers ranged from less than one year to greater than twenty years. Almost 60% of the respondents indicated they had between three to ten years of active duty experience as a nurse anesthetist. A total of eight respondents indicated they had over 16 years of experience. The frequencies and percents of the total respondents were presented in Table 2.

Table 2

Years of Active Duty Military Service as a Nurse Anesthetist

	Years of Service								
Military Branch of Service	< 1 year	1 to 2 years	3 to 5 years	6 to 10 years	11 to 15 years	16 to 20 years	> 20 years	No response	Total
Navy	0	1	12	2	2	1	0	1	19
Army	0	2	10	9	7	4	1	2	35
Air Force	1	7	11	7	3	1	1	0	31
Public Health	0	2	0	4	1	0	0	0	7
Total	1	12	33	22	13	6	2	3	92
Percent	1.09%	13.04%	35.87%	23.91%	14.13%	6.52%	2.17%	3.26%	100.00%

Analysis of the relationship between years of active duty military service and branch of service produced a Pearson Chi-square value of 26.141, with df = 21 and p value = 0.201, which indicated no statistically significant difference between the branches. When the data on years of service was grouped according to facility size, the Pearson Chi-square value was 22.721, the df = 28 and the p value = 0.747. This again indicated no significant difference.

Years of Anesthesia Experience

The respondents next recorded their total number of years of experience as a nurse anesthetist. This question used the same range of answers as used for years of active duty military service. The highest percentage of respondents (35.87%) revealed they had between 3 to 5 years of total experience as a nurse anesthetist. Over 60% had between 3 to 10 years of experience. Table 3 depicted the frequencies for the four branches of service.

Table 3

Total Years of Experience as a Nurse Anesthetist

	Years of Experience								
Military Branch of Service	< 1 year	1 to 2 years	3 to 5 years	6 to 10 years	11 to 15 years	16 to 20 years	> 20 years	No response	Total
Navy	0	1	11	4	2	1	0	0	19
Army	0	3	10	10	7	4	1	0	35
Air Force	0	7	11	6	4	2	1	0	31
Public Health	0	1	1	3	0	1	1	0	7
Frequency	0	12	33	23	13	8	3	0	92
Percent	0.00%	13.04%	35.87%	25.00%	14.13%	8.70%	3.26%	0%	100.00%

There was no significant difference in years of experience between the different branches of service. The Chi-square value was 15.149, df = 15 and p value = 0.419. When the same statistical test was run based on facility size, again no significant difference was found, the Chi-square value was 13.285, df = 20 and p value = 0.865.

Pay Grade

Military pay grade consistently indicated rank across all of the services. Respondents were asked to indicate their pay grade. The range of answers was 01 through 06. A higher numbered pay grade indicates a higher rank. Table 4 displayed these results.

Table 4

Pay Grade by Branch of Service

	Branch of Service				
Pay Grade	Navy	Army	Air Force	Public Health	Total
03	4	7	16	1	28
04	10	13	11	2	36
05	5	10	4	3	22
06	0	2	0	1	3
Total	19	32	31	7	89

Note. There were no respondents in pay grades 01 or 02. Three respondents did not answer the question.

The initial analysis of the relationship between branch of service and pay grade yielded a Chi-square value of 20.952, df = 12 and p value = 0.051. Since this probability was near

a level of significance, the table was edited to remove the missing data category and the analysis was rerun using StatXact and employing a Monte Carlo method. This more accurate method of analysis yielded a Chi-square value of 15.580, df = 9 and p value = 0.073. Though close, there was no significant difference in pay grade among the four branches of service.

The data was reanalyzed according to facility size. Analysis of the relationship between pay grade and facility size found no significant difference. The Chi square value was 18.199, df = 16 and p value = 0.312.

Age

The age of respondents ranged from 30 to 59 years and averaged 41 years. The average age of respondents from the Navy, Army and Air Force varied from 40.43 to 40.80 years. Respondents from the Public Health Service averaged 45.86 years of age. Age was treated as a continuous variable and ANOVA performed. The results were shown in Table 5.

Table 5

ANOVA for Age by Branch of Service

	Measures of Variance				
Source	SS	df	MS	F-ratio	p
Between Branches	179.622	3	59.874	2.300	0.083
Error	2,264.334	87	26.027		

The p value of 0.083 was not significant but was close enough to 0.05 that further analysis was performed. These results were provided in Table 6 and Table 7.

Table 6

Matrix of Pairwise Differences in Age by Branch of Service

	Branch of Service			
Branch of Service	Navy	Army	Air Force	Public Health
Navy	0			
Army	0.256	0		
Air Force	0.116	0.371	0	
Public Health	5.173	5.429	5.057	0

Table 7

Matrix of Pairwise Probabilities in Age by Branch of Service

	Branch of Service			
Branch of Service	Navy	Army	Air Force	Public Health
Navy	1			
Army	0.998	1		
Air Force	>0.999	0.991	1	
Public Health	0.108	0.057	0.092	1

The Public Health service differed from the others by more than 5 years, but only the difference with the Army approached statistical significance.

ANOVA was again used to explore the relationship between age and facility size. The results of this analysis were displayed in Table 8.

Table 8

ANOVA for Age by Facility Size

	Measures of Variance				
Source	SS	df	MS	F-ratio	p
Between Facilities	67.071	4	16.768	0.607	0.659
Error	2.376.885	86	27.638		

In this case, the p value did not border statistical significance and no further analysis was indicated.

Gender

Of the respondents who indicated their gender 31 were female and 58 were male The frequencies by branch of service were presented in Table 9.

Table 9

Gender Frequency by Branch of Service

	Branch of Service				
Gender	Navy	Army	Air Force	Public Health	Total
No response	0	1	1	1	3
Female	10	10	9	2	31
Male	9	24	21	4	58
Total	19	35	31	7	92

Analysis produced a Chi-square value of 6.853, df = 6 and p value = 0.335. There was no significant difference in gender among the four branches of service. When the data were analyzed to explore the relationship between gender and facility size, again no significant differences were discovered. The Chi-square value was 8.750, df = 8 and p value = 0.364.

Facility Size, Staffing and Number of Cases

The next three questions collected data on the number of inpatient beds in the facility in which the anesthetist worked, the number of nurse anesthetists and anesthesiologists on the staff at the facility, and the number of cases the anesthetist performed in the calendar year 1995. Data from these questions were tabulated below.

Table 10

Average Staffing and Case Numbers by Branch of Service and Facility Size

Branch of Service	Facility Size	# CRNAs	# MDAs	# cases
Navy	0 to 49 Beds	1.67	1	323.33
	50 to 99 Beds	4	3.67	353.33
	100 to 199 Beds	5.6	5.4	420
	200 to 500 Beds	11.86	20.57	337.14
Army	0 to 49 Beds	1.88	0.62	466.25
	50 to 99 Beds	5	1.57	435.71
	100 to 199 Beds	7.4	4.2	540
	200 to 500 Beds	13.14	11.46	454.17
	> 500 Beds	13	35	500
Air Force	0 to 49 Beds	3.06	1.35	376.47
	50 to 99 Beds	5.25	3.75	510
	100 to 199 Beds	8.33	5	583.33
	200 to 500 Beds	14.5	11.8	662.5
	> 500 Beds	22	16.5	550
Public Health	0 to 49 Beds	1	0.5	275
	50 to 99 Beds	3	1	625
	100 to 199 Beds	6.5	4	500
	200 to 500 Beds	9	4	*

Note. * No response.

The data on facility size produced no significant differences among the four branches. The Chi-square value was 18.323, df = 12 and p value = 0.108. There was also no significant difference in staffing among the services. For nurse anesthetists the Chi-square value was 69.173, the df = 60 and p value = 0.183. For anesthesiologists, the Chi-square value was 24.990, df = 18 and p value = 0.183. Fourteen percent of respondents reported no anesthesiologist on the staff of their facility.

Case numbers were treated as a continuous variable and ANOVA performed. The p value of 0.324 indicated no significant differences in number of cases among the four branches of service. The mean annual number of cases for all respondents was 444.37. Annual case numbers ranged from 10 to 1,000.

Table 11

ANOVA for Cases by Branch of Service

	Measures of Variance				
Source	SS	df	MS	F-ratio	p
Between Branches	159,559,725	3	53,186,575	1.175	0.324
Error	3,755,428,505	83	45,246,127		

Analysis of the relationship between staffing and facility size not surprisingly revealed some statistically significant differences. The number of nurse anesthetists and anesthesiologists increased with increasing facility size. For nurse anesthetists the Chi-square value was 87.920, the df = 16 and the p value = <0.001. For anesthesiologists the Chi-square value was 21.690, df = 12 and p value = 0.062, which approached statistical significance.

Case numbers by facility size did not demonstrate any statistically significant differences. Again case numbers were treated as a continuous variable and ANOVA performed.

Table 12

ANOVA for Cases by Size of Facility

	Measures of Variance				
Source	SS	df	MS	F-ratio	p
Between Facilities	177,849.650	4	44,462.4138	0.976	0.426
Error	3,737,138.5805	82	45,574.861		

Age of Cases

The next question provided data on the percentage of cases by age that the anesthetist performed during 1995. The average percentage grouped by branch of service and size of facility was tabulated in Table 13.

Table 13

Average Percentage of Cases by Age

		Age of Cases				
Branch	Facility Size	%infant	%child	%adolescent	%adult	%elderly
Navy	0 to 49 Beds	3	6.33	4.33	80	6.33
	50 to 99 Beds	5	8	6.33	67	13.33
	100 to 199 Beds	3.4	7.8	4.4	68.17	17.17
	200 to 500 Beds	1.57	3.64	3.79	78.71	12.29
Army	0 to 49 Beds	2.88	8.25	7.25	71	10.62
	50 to 99 Beds	6.83	10	15	51.5	16.67
	100 to 199 Beds	5.4	13.6	6.6	64	10.4
	200 to 500 Beds	5.08	9.38	11.23	52.15	22.08
	> 500 Beds	1	2	0.5	96	0.5
Air Force	0 to 49 Beds	1.53	5.24	8.06	70.82	14.35
	50 to 99 Beds	2.25	7.75	8	65	17
	100 to 199 Beds	4	8.67	9	37	39.67
	200 to 500 Beds	2	5.25	4.25	56.25	32.25
	> 500 Beds	3.5	9	7.5	70	10
Public Health	0 to 49 Beds	0.5	2.5	2.5	88.5	6
	50 to 99 Beds	5	12.5	5	67.5	10
	100 to 199 Beds	8.75	17.5	11.25	37.5	25
	200 to 500 Beds	5	20	15	40	20

Analysis of the age of cases both by branch of service and facility size demonstrated no statistically significant differences. These results are displayed in Tables 14 and 15.

Table 14

Analysis of Age of Cases by Branch of Service

Variable	Chi-Square	df	p
Infant	14.150	9	0.121
Child	17.640	12	0.117
Adolescent	59.283	48	0.127
Adult	101.532	87	0.137
Elderly	65.203	69	0.607

Table 15

Analysis of Age of Cases by Facility Size

Variable	Chi-Square	df	p
Infant	49.482	40	0.145
Child	71.221	60	0.152
Adolescent	73.813	64	0.188
Adult	126.621	116	0.236
Elderly	105.251	92	0.163

ASA Classification

Respondents were asked to estimate the percentage of cases for each ASA classification for cases they performed during 1995. The average percentage for each ASA classification sorted by branch of service and facility size was presented in Table 16.

Table 16

Average Percentage of Cases by ASA Classification

Branch of Service	Facility Size	Percent ASA Classification				
		I	II	III	IV	V
Navy	0 to 49 Beds	36.67	55	4.67	3.33	0.33
	50 to 99 Beds	31.67	56.33	6.63	5.67	1.17
	100 to 199 Beds	39.17	45.83	14	1.2	0
	200 to 500 Beds	58.57	28.43	9.71	3.14	0.14
Army	0 to 49 Beds	39.38	48.75	10.25	1.62	0
	50 to 99 Beds	39.79	45	11.57	2.92	1.33
	100 to 199 Beds	37	41.8	17.6	3.4	0.2
	200 to 500 Beds	34.92	38.08	21.77	5	0.62
	> 500 Beds	50	45	5	0	0
Air Force	0 to 49 Beds	37.29	50.59	9.82	1.88	0.41
	50 to 99 Beds	46.5	42.25	10.25	1	0
	100 to 199 Beds	14.67	36.67	44.67	3.67	0.33
	200 to 500 Beds	20	46	28.75	5	0.25
	> 500 Beds	30	50	15	4.5	0.5
Public Health	0 to 49 Beds	61.5	27.5	10	1	0
	50 to 99 Beds	30	55	12.5	2.5	0
	100 to 199 Beds	15	30	47.5	5	2.5
	200 to 500 Beds	10	50	30	5	5

Analysis of the ASA classification data yielded no statistically significant differences in relationship by both branch of service and facility size. These results were displayed in Tables 17 and 18.

Table 17

Analysis of ASA Classification by Branch of Service

Variable	Chi-Square	df	p
ASAI	62.497	63	0.494
ASAII	67.982	78	0.784
ASAIII	74.809	84	0.753
ASAIV	22.777	33	0.909
ASAV	19.467	15	0.193

Table 18

Analysis of ASA Classification by Facility Size

Variable	Chi-Square	df	p
ASAI	91.727	84	0.264
ASAII	109.847	104	0.328
ASAIII	101.264	112	0.757
ASAIV	53.907	44	0.146
ASAV	15.793	20	0.729

Emergent versus Elective Cases

The next question asked respondents to estimate the percentage of elective versus emergency cases they performed during the calendar year 1995. Table 19 provided the average percentage of emergency and elective cases sorted by branch of service and facility size.

Table 19

Average Percentage of Emergency and Elective Cases

Branch of Service	Facility Size	Urgency	
		%Elective	%Emergency
Navy	0 to 49 Beds	80.67	19.33
	50 to 99 Beds	94.33	5.67
	100 to 199 Beds	84.17	15.83
	200 to 500 Beds	89.86	10.14
Army	0 to 49 Beds	88.5	11.5
	50 to 99 Beds	87.86	12.14
	100 to 199 Beds	78.4	21.6
	200 to 500 Beds	85.17	14.83
	> 500 Beds	80	20
Air Force	0 to 49 Beds	84.62	15.38
	50 to 99 Beds	80	20
	100 to 199 Beds	87.67	12.33
	200 to 500 Beds	78.75	21.25
	> 500 Beds	80	20
Public Health	0 to 49 Beds	95	5
	50 to 99 Beds	80	20
	100 to 199 Beds	80	20
	200 to 500 Beds	90	10

Analysis of this data yielded no statistically significant differences among the four branches of service or the range of facility sizes.

Table 20

Analysis of Emergency versus Elective Cases by Branch of Service

Variable	Chi-Square	df	p
Elective	48.701	45	0.326
Emergency	48.701	45	0.326

Table 21

Analysis of Emergency versus Elective Cases by Facility Size

Variable	Chi-Square	df	p
Elective	59.811	60	0.483
Emergency	59.811	60	0.483

Independence of Practice

The second section of the survey used a frequency scale to determine independence of practice. The possible responses were: (a) Never; (b) For some cases; (c) For most cases; and (d) Always. For statistical analysis, these answers were coded as 0, 1, 2, and 3 respectively.

The first set of questions concerned pre-operative, intra-operative and post-operative management of respondents' cases. Respondents estimated the frequency of pre-operative assessment by themselves (PRECRNA) or by an anesthesiologist (PREMDA). For induction they estimated the frequency of cases in which the induction was performed by an anesthesiologist (INDMDA), by themselves with an anesthesiologist present (INDC&MD), by themselves with an anesthesiologist in house (INDMDIN), or by themselves with no anesthesiologist in house (INDCRNA). For intra-operative management respondents estimated the frequency of cases in which the anesthesiologist was present (INTMDPRE), in house (INTMDINH), or not in house (INTCRNA). This same question was posed for emergence (EMRMDPRE, EMRMDINH. and EMRCRNA). For Post Anesthesia Care Unit (PACU) management, as with induction, respondents estimated the frequency of cases in which the PACU management was performed by an anesthesiologist (PACMDA), by themselves with an anesthesiologist present (PACCR&MD), by themselves with an anesthesiologist in house (PACMDINH), or by themselves with no anesthesiologist in house (PACCRNA). Finally for Post-operative evaluation, the respondents were asked the

frequency of times the evaluation was performed by themselves (POSTCRNA) or by an anesthesiologist (POSTMDA). Table 22 displayed the resulting analysis.

Table 22

Analysis of Independence of Practice by Branch of Service

Variable	Chi-Square	df	p
PRECRNA	8.913	9	0.445
PREMDA	12.010	9	0.207
INDMDA	7.102	6	0.305
INDC&MD	11.118	9	0.268
INDMDIN	12.841	12	0.381
INDCRNA	12.190	9	0.208
INTMDPRE	10.810	6	0.116
INTMDINH	15.006	12	0.241
INTCRNA	15.040	9	0.082
EMRMDPRE	8.905	3	0.026*
EMRMDINH	14.073	12	0.296

Variable	Chi-Square	df	p
EMRCRNA	10.420	9	0.324
PACMDA	14.580	9	0.111
PACCR&MD	13.326	9	0.148
PACMDINH	14.746	12	0.256
PACCRNA	13.810	12	0.313
POSTCRNA	12.256	12	0.425
POSTMDA	14.388	12	0.277

Note. *p < .05.

Only in the response emergence with an anesthesiologist present was there a significant difference between the services. A look at the data revealed that an anesthesiologist was more frequently present during emergence in the Army; however, for all of the services, responses were either never or for some cases. None of the anesthetists in any service responded that an anesthesiologist was present for most cases or always.

Analysis of the data produced more significant differences when the data was grouped by facility size. The only area of peri-operative management in which there was not a

significant difference was that of induction by an anesthesiologist (INDMDA). The results of this analysis were shown in Table 23.

Table 23

Analysis of Independence of Practice by Facility Size

Variable	Chi-Square	df	p
PRECRNA	17.040	8	0.025*
PREMDA	26.630	12	0.038*
INDMDA	10.859	12	0.541
INDCR&MD	19.540	8	0.013*
INDMDIN	37.590	12	<0.001*
INDCRNA	41.600	12	<0.001*
INTMDPRE	16.200	8	0.042*
INTMDINH	43.040	12	0.001*
INTCRNA	45.360	12	<0.001*
EMRMDPRE	17.620	4	0.001*
EMRMDINH	43.280	12	<0.001*

Variable	Chi-Square	df	p
EMRCRNA	45.160	12	<0.001*
PACMDA	30.160	12	0.038*
PACCR&MD	19.040	89	0.018*
PACMDINH	35.850	12	<0.001*
PACCRNA	47.670	12	<0.001*
POSTCRNA	22.240	12	0.047*
POSTMDA	33.200	12	0.027*

Note. * $p < .05$.

The tables below displayed the average score for each facility size category. The responses were coded according to the following scale: 0 -- Never; 1 -- For Some Cases; 2 -- For Most Cases and 3 -- for Always. The variation across facility sizes was most clearly demonstrated in the CRNA only column of Tables 24 through 29.

Table 24

Average Frequency Score for Pre-operative Evaluation by Facility Size

	Pre-op Evaluation by	
Facility Size	CRNA	MDA
0 - 49 Beds	2.5	0.5
50 - 99 Beds	2.12	0.93
100 - 199 Beds	1.88	1.21
200 - 500 Beds	1.96	0.96
> 500 Beds	2	1.33

Table 25

Average Frequency Score for Induction by Facility Size

	Induction by			
Facility Size	MDA	CRNA&MD	CRNA with MD in house	CRNA only
0 - 49 Beds	0.04	0.3	0.9	2.22
50 - 99 Beds	0.31	0.5	1.75	1.25
100 - 199 Beds	0.43	0.86	1.56	1.36
200 - 500 Beds	0.17	0.87	2.12	0.78
> 500 Beds	0	0.67	2	0.67

Table 26

Average Frequency Score for Intra-operative Management by Facility Size

	Intra-operative Management		
Facility Size	MD present	MD in house	CRNA only
0 - 49 Beds	0.19	0.83	2.22
50 - 99 Beds	0.5	1.62	1.25
100 - 199 Beds	0.5	1.69	1.29
200 - 500 Beds	0.79	2.2	0.7
> 500 Beds	0.33	2.33	0.67

Table 27

Average Frequency Score for Emergence by Facility Size

	Emergence		
Facility Size	MD present	MD in house	CRNA only
0 - 49 Beds	0.11	0.83	2.21
50 - 99 Beds	0.31	1.69	1.38
100 - 199 Beds	0.5	1.69	1.36
200 - 500 Beds	0.65	2.19	0.74
> 500 Beds	0.67	2	0.67

Table 28

Average Frequency Score for PACU Management by Facility Size

	PACU Management by			
Facility Size	MDA	CRNA&MD	CRNA with MD in house	CRNA only
0 - 49 Beds	0.3	0.37	0.79	2.25
50 - 99 Beds	0.69	0.69	1.44	1.25
100 - 199 Beds	1.21	0.57	1.25	1.14
200 - 500 Beds	1.13	0.74	1.8	0.75
> 500 Beds	0.67	1	1.67	0.67

Table 29

Average Frequency Score for Post-operative Evaluation by Facility Size

	Post-op Evaluation by	
Facility Size	CRNA	MDA
0 - 49 Beds	2.73	0.33
50 - 99 Beds	2.12	0.75
100 - 199 Beds	1.94	1.07
200 - 500 Beds	2.36	0.71
> 500 Beds	2.67	0.33

Regional Techniques

The next set of questions focused on regional techniques. The same frequency scale was used as in the previous set of questions. Respondents were asked to estimate the frequency of times they administered the regional anesthetic for cases that required them. The techniques covered were subarachnoid block (SAB), epidural (EPID), brachial plexus blocks (PLEXUS), transtracheal blocks (TRANSTRA), IV regional blocks (IVREGION), caudal (CAUDAL) and peribulbar blocks (PERIBULB).

Table 30

Analysis of Regional Techniques by Branch of Service

Variable	Chi-Square	df	p
SAB	19.420	9	0.030*
EPID	11.613	12	0.477
PLEXUS	43.820	9	<0.001*
TRANSTRA	18.850	9	0.024*
IVREGION	11.697	12	0.470
CAUDAL	18.580	9	0.028*
PERIBULB	6.295	12	0.900

Note. * $p < .05$.

Significant differences were found among the four branches of service in the administration of sub-arachnoid blocks, brachial plexus blocks, transtracheal blocks and caudal blocks. In the case of sub-arachnoid block, the lowest average frequency score was 2.1. Forty-nine of 91 respondents performed brachial plexus blocks when they were required. The Public Health Service varied most from the other services with four of seven respondents never performing this block.

For transtracheal and caudal blocks, the majority of respondents reported performing these blocks for some or all cases. Only in the Public Health Service did the majority of respondents, four of seven, answer that they never performed these blocks. The average frequency scores for these questions were presented in Table 31.

Table 31

Average Frequency Scores for Sub-arachnoid, Caudal, Transtracheal, and Brachial Plexus Blocks by Branch of Service

	Average Frequency Score			
Branch of Service	SAB	Caudal	Transtracheal	Plexus
Navy	2.58	2.21	2	2.47
Army	2.56	1.85	2.09	2.41
Air Force	2.13	1.39	1.42	2
Public Health	2.43	0.43	1	1

The data was reanalyzed to identify differences by facility size. Table 32 displayed the results.

Table 32

Analysis of Regional Techniques by Facility Size

Variable	Chi-Square	df	p
SAB	22.663	16	0.123
EPID	15.550	16	0.485
PLEXUS	20.243	16	0.209
TRANSTRA	18.110	16	0.318
IVREGION	23.142	16	0.110
CAUDAL	32.990	12	0.002*
PERIBULB	40.480	12	0.008*

Note. * $p < .05$.

Only in the administration of caudal and peribulbar blocks were significant differences found. The highest average frequency score for caudal blocks was in facilities from 50 to 99 beds. The average frequency scores for peribulbar blocks were low for all of the facility size categories.

Table 33

Average Frequency Score for Caudal and Peribulbar Blocks by Facility Size

	Average Frequency Score	
Facility Size	Caudal	Peribulbar
0 to 49 Beds	1.13	0.17
50 to 99 Beds	2.44	0.19
100 to 199 Beds	1.62	0
200 to 500 Beds	1.85	0.04
> 500 Beds	1.33	1

Airway Management

The next set of questions concerned airway management procedures. The techniques covered were direct visual laryngoscopy (DVL), laryngeal mask airway (LMA), fiberoptic intubation (FIBEROP), double lumen tubes (DLT), and crycothyrotomy (CRYCTHYR). For cases that required these procedures, respondents were asked to estimate the frequency of times they performed the procedure using the same frequency scale as used previously. As indicated in Table 34, no significant differences were found between the branches of service in these airway management techniques.

Table 34

Analysis of Airway Management Techniques by Branch of Service

Variable	Chi-Square	df	p
DVL	8.257	9	0.508
LMA	12.284	12	0.423
FIBEROP	7.823	12	0.799
DLT	17.397	12	0.135
CRYCTHYR	6.146	12	0.909

This was not the case when the data was analyzed according to facility size. Table 35 provided these results.

Table 35

Analysis of Airway Management Techniques by Facility Size

Airway Management Technique	Chi-Square	df	p
DVL	9.012	12	0.702
LMA	26.610	12	0.010*
FIBEROP	20.931	16	0.181
DLT	39.230	12	<0.001*
CRYCTHYR	24.010	12	0.039*

Note. * $p < .05$.

There were significant differences in the use of laryngeal mask airways, double lumen tubes and crycothyrotomy among the different facility sizes. The lowest score for laryngeal mask airway and double-lumen tubes were from anesthetists in facilities with less than 50 beds. Scores for crycothyrotomy were consistently low for all facility sizes but, highest in those over 500 beds.

Table 36

Average Frequency Score for LMA and DLT by Facility Size

	Average Frequency Score		
Facility Size	LMA	DLT	CRYCTHYR
0 - 49 Beds	1.7	0.9	0.3
50 to 99 Beds	2.56	1.88	0.19
100 to 199 Beds	2.12	1.81	0.31
200 to 500 Beds	2.31	2.23	0.32
> 500 Beds	2.33	1.33	0.67

Line Placement

The final set of questions focused on line placement. As before, the same frequency scale was used and respondents were asked to estimate the frequency of their performance of these procedures for cases that required them. The procedures covered were arterial lines (ALINE), central venous lines (CENTVEIN), and pulmonary artery catheters (PACATHS). The average frequency scores were 2.04, 1.30 and 0.87 for arterial line, central line and PA catheter placement respectively. Analysis of the data by branch of service found no significant differences.

Table 37

Analysis of Line Placement by Branch of Service

Line Procedure	Chi-Square	df	p
ALINE	16.898	12	0.153
CENTVEIN	9.523	12	0.658
PACATHS	10.453	12	0.576

Analysis by facility size revealed a significant difference in central venous line placement.

Table 38

Analysis of Line Placement by Facility Size

Line Procedure	Chi-Square	df	p
ALINE	18.880	16	0.275
CENTVEIN	28.180	12	0.0048
PACATHS	20.859	16	0.184

Note. * $p < .05$.

Summary

Ninety-two of 150 surveys were returned for a response rate of 61.33%. The categorical data was tabulated, and frequency and percentage determined. To explore relationships, two way tables of frequencies were prepared, first by branch and second by facility size. Asymptotic chi-square values were used as a rough screen of relationships. If probabilities were less than or equal to 0.10, the tables were edited to remove missing data and reanalyzed using a Monte Carlo method. Means and standard deviations were calculated for age and number of cases. Group effects for these variables were explored by ANOVA and the Tukey HSD multiple comparison test.

The data analysis indicated significant differences between the branches in the areas of independence of practice and regional techniques. A greater number of significant differences appeared when the data was reanalyzed according to facility size.

Chapter Five

Discussion

Purpose of the Study

The goals of this study were: (a) to explore systematically the scope of practice of active duty military nurse anesthetists in the United States Army, Air Force, Navy and Public Health Service; (b) to identify differences in the practice patterns of nurse anesthetists among the uniformed services; and (c) to establish a foundation of data for a future comparison to civilian nurse anesthetists. The null hypothesis stated that there are no differences in scope of practice of active duty military nurse anesthetists among the uniformed services.

Hypothesis Testing

The results indicated no statistically significant differences among the four services in the areas of years of active duty service, years of anesthesia experience, gender or pay grade. This supports the null hypothesis. In the areas of facility size, numbers of nurse anesthetists and anesthesiologists on staff there was again produced no statistically significant differences among the services. This was also true in case number, case type by

age, ASA classification and urgency. In the categories of airway management and line placement procedures, the null hypothesis was supported.

In the questions on independence of practice in peri-operative management only the response, "MD present for emergence," yielded a statistically significant difference. None of the anesthetists in any service responded that an anesthesiologist was present for most cases or always. Though the statistics may support the hypothesis for this category, it has little practical significance.

In regional techniques, the analysis revealed significant differences among the services in four procedures: sub-arachnoid; brachial plexus; transtracheal and caudal blocks. Though the statistics may show a significant difference, the lowest average frequency score for sub-arachnoid block was 2.1, which indicated that on average anesthetists were performing the block for most cases. The data on plexus, transtracheal and caudal blocks showed that the Public Health Service varied the most from the other services with four of seven respondents never performing these procedures.

With only a few exceptions in independence of practice and regional techniques, there were no significant differences in scope of practice among the four branches of service. The exception in independence of practice may have little practical significance. In the differences among the regional techniques, the service which varied the most from the others was the Public Health Service. In the areas of demographics, case numbers and types, line placement and airway management, the null hypothesis was completely supported.

Differences in Practice by Facility Size

When compared by facility size, the data revealed a greater number of significant differences. There were no significant differences among the various facility sizes in the demographic data, with the exception being the number of nurse anesthetists on staff. That different sized facilities would have different numbers of anesthetists on staff makes sense; surprisingly, the number of anesthesiologists on staff did not show a significant difference. In the areas of case numbers and type by age, urgency and ASA classification there were also no significant differences among different sized facilities.

In the area of independence of practice in peri-operative management, all areas but one demonstrated a significant difference. The frequency scores indicating independence in peri-operative management decreased with increasing facility size. There was not a corresponding increase in the acuity of cases by ASA classification to explain the decreased independence. Larger facilities may have an anesthesiologist in house at all times, accounting for the higher scores for larger facilities for the in house response. This does not necessarily mean that the anesthesiologist is actively involved in the case.

Some significant differences in the use of regional anesthetics and airway management procedures were found according to facility size. Frequency scores tended to be higher for techniques such as peribulbar blocks, crycothyrotomies and double lumen tubes in larger facilities. To summarize, fewer significant differences were found among the services than among the various facility sizes.

Comparisons with Prior Studies

No data comparable to many areas of this study existed in the literature. In some cases; however, comparisons could be made. The mean age of 41 years was similar to data reported by Garde (1994) which indicated the highest age category among AANA membership survey respondents to be 40 to 44 years. The gender distribution in Garde's survey was 42% male, 58% females. This distribution was nearly reversed among this study's respondents.

Garde also reported that for nurse anesthetists working in the hospital setting the average number of cases performed annually was 726. The average number of cases for respondents to this survey was 444. The 1985 AANA Annual Membership Survey demonstrated a similar divergence in case numbers.

Zaglaniczny's (1993) data from the Professional Practice Analysis revealed 28.8 to 30.9% of respondents' cases were in the elderly age category. Only in Air Force facilities from 100 to 500 beds was this percentage exceeded. Overall, military anesthetists did fewer cases on elderly patients and more on adult patients than the anesthetists who responded to the PPA. The health of patients served by military anesthetists was better than those responding to the PPA. This study's respondents reported higher percentages of cases for ASA I and ASA II patients, and lower percentages on ASA's III through V than PPA respondents. The numbers on elective versus emergent cases were similar in the two studies. Considering that the focus of military health care is to maintain the health of an active duty personnel and their dependents, these numbers were not surprising.

Although military retirees are also served by the military health care system, their numbers do not seem to equal those served by the anesthetists responding to the PPA.

The fourteen percent of respondents who worked in a facility without an anesthesiologist was similar to the findings from the survey by Lester and Thomson (1989) which indicated 21% of respondents in a similar situation. Rosenbach and Cromwell (1989) data revealed that 6.1% of anesthetists in federal hospitals worked without an anesthesiologist.

Rosenbach and Cromwell also presented data on the administration of regional anesthetics. Their data revealed 29.3% of anesthetists administered regional anesthetics. One hundred percent of the respondents to this study administered some form of regional anesthesia. For most cases that required a regional anesthetic, the nurse anesthetists who completed the survey administered the various blocks.

The highest frequency and expertise scores for regional techniques in Zaglaniczny's data were for subarachnoid and epidural blocks. Her data indicated that transtracheal and eye blocks were performed rarely. This was consistent with data from this study.

In the area of line placement, Rosenbach and Cromwell's data indicated that 36.2% of nurse anesthetists regularly performed arterial line placement. Ninety-four percent of this survey's respondents reported placing arterial lines for some or more cases. The percentage of this study's respondents placing central lines and pulmonary artery catheters for some or more cases also exceeded the percentages reported by Rosenbach and

Cromwell. Comparable data on airway management procedures and independence of practice in perioperative management was not available.

In conclusion, the data from this study indicated that military nurse anesthetists were similar in age and more likely to be male than the overall population of anesthetists. Military anesthetists reported doing fewer cases than the population of anesthetists as a whole. The patients they served were more likely to be classified as ASA I or II and less likely to be elderly. The percentage of military anesthetists performing regional anesthesia and line placement exceeded the data from previous studies of all nurse anesthetists.

Limitations

A perfect study of military nurse anesthesia practice would be prospective, include anesthetists working at locations overseas and within the United States, and would explore practice patterns during both a peace and wartime environment. This study had a narrower view of military nurse anesthesia practice limited to those serving in facilities within the 50 states during peacetime operations. The data collected was based on the recall of the respondents, and therefore subject to bias. Although 30% of the anesthetists in each service were surveyed, and the response rate was 61%, the perils of small sample size could still affect these results. In the case of the Public Health Service, 30% produced a sample size of seven. There may be more or less diversity within the Public Health Service than indicated by the results reported in this study.

The comparison of data from this study with earlier studies of nurse anesthesia practice is subject to the limitations of the earlier research. The broadest survey, the Professional Practice Analysis, did not study the entire population of nurse anesthetists. Any conclusions based on the data from this and earlier studies needs to be tempered with these limitations in mind.

Recommendations for Future Study

One respondent who had worked in both military and civilian facilities denied that military anesthetists have a wider scope of practice than civilians and stated that this manner of thinking represented an unsupported "elitist" attitude. Systematically obtained support for his statement must be deferred to future research. To adequately study the differences between military and civilian scope of practice, one study using a consistent instrument and analysis would be needed. Since the population of civilian nurse anesthetists is large, surveying an adequate sample would require a great deal of resources. This population could be narrowed some by limiting the study to hospital based anesthetists.

As mentioned in the previous section, to adequately examine military practice, a study exploring both peace and wartime environments would be needed. Conducting a study during a war would most likely be unfeasible; it is doubtful that the emphasis during a field operation would be on returning surveys. One possibility would be to survey anesthetists who have just returned from field operations.

Finally, some respondents commented that some survey questions were awkward and difficult to understand. The questions referred to were those which used the frequency scale. Misunderstanding might be avoided with the use of another frequency scale used in the Professional Practice Analysis: (a) Never; (b) Rarely; (c) Monthly; (d) Weekly and (e) Daily.

Conclusion

This study found a great deal of uniformity in the scope of practice of nurse anesthetists among the uniformed services. The service which differed the most from the others was the Public Health Service. Significant differences in independence of practice existed when practice was explored by facility size. The anesthetist in a smaller facility was more likely to practice independently than one in a larger facility. Comparison with previous research indicated that a greater percentage of military anesthetists were performing regional anesthesia and line placement than civilian anesthetists, yet they served a healthier and younger population. To adequately compare civilian and military practice; however, will require an expanded study.

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Appendix 1

Data Collection Forms

Survey of Scope of Practice of Military Nurse Anesthetists

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Directions: For most questions, please check the most appropriate box. Some questions ask you to write in information -- spaces are provided for your answers. Please answer using your best judgment. Consulting records is not required.

1. Please mark the branch of the uniformed services in which you are on active duty.

   ☐ Navy
   ☐ Army
   ☐ Air Force
   ☐ Public Health Service

2. How many years of **active duty military service** have you served as a nurse anesthetist?

   ☐ < 1
   ☐ 1 to 2
   ☐ 3 to 5
   ☐ 6 to 10
   ☐ 11 to 15
   ☐ 16 to 20
   ☐ > 20

3. How many years have you been a nurse anesthetist?

   ☐ < 1
   ☐ 1 to 2
   ☐ 3 to 5
   ☐ 6 to 10
   ☐ 11 to 15
   ☐ 16 to 20
   ☐ > 20

4. What is your pay grade?

   ☐ 01
   ☐ 02
   ☐ 03
   ☐ 04
   ☐ 05
   ☐ 06

5. What is your age?

   ____

6. What is your gender?

   ☐ Female
   ☐ Male

7. What is the size of the facility in which you currently work?

   ☐ 0 to 49 beds
   ☐ 50 to 99
   ☐ 100 to 199 beds
   ☐ 200 to 500
   ☐ > 500

8. How many nurse anesthetists and anesthesiologists work in your facility?

   ____ Anesthesiologists
   ____ Nurse anesthetists

9. During the calendar year 1995 how many anesthetics did you administer?

   ____

10. Please estimate the percentage of your patients during the 1995 calendar year who fell into the age categories listed below.

Infants (birth to 2 yrs)	____%
Children (3 to 12 yrs)	____%
Adolescents (13 to 17 yrs)	____%
Adults (18 to 65 yrs)	____%
Elderly (over 65 yrs)	____%
	100% Total

Continued on next page

11. Please estimate the percentage of your patients during the 1995 calendar year who fell into the following ASA categories.

Class I	____%
Class II	____%
Class III	____%
Class IV	____%
Class V	____%
	100% Total

12. Please estimate the percentage of elective and emergency anesthetic cases you performed during the 1995 calendar year.

Elective	____%
Emergency	____%
	100% Total

In the following section, please check the box that most accurately represents how *you* practice.

	Frequency			
	Never	For some cases	For most cases	For every case
Case planning, management and evaluation				
1. Pre-op assessment				
a. by you	☐	☐	☐	☐
b. by an anesthesiologist	☐	☐	☐	☐
2. Induction:				
a. by an anesthesiologist	☐	☐	☐	☐
b. by you with an anesthesiologist present	☐	☐	☐	☐
c. by you with an anesthesiologist in house	☐	☐	☐	☐
d. by you without an anesthesiologist in house	☐	☐	☐	☐
3. Intra-operative management:				
a. with an anesthesiologist present	☐	☐	☐	☐
b. with an anesthesiologist in house	☐	☐	☐	☐
c. without an anesthesiologist in house	☐	☐	☐	☐
4. Emergence:				
a. with an anesthesiologist present	☐	☐	☐	☐
b. with an anesthesiologist in house	☐	☐	☐	☐
c. without an anesthesiologist in house	☐	☐	☐	☐
5. PACU management:				
a. by an anesthesiologist	☐	☐	☐	☐
b. by you with an anesthesiologist present	☐	☐	☐	☐
c. by you with an anesthesiologist in house	☐	☐	☐	☐
d. by you without an anesthesiologist in house	☐	☐	☐	☐
6. Post-operative evaluation				
a. by you	☐	☐	☐	☐
b. by an anesthesiologist	☐	☐	☐	☐

Continued on next page

For cases requiring the following, please check the box that best indicates how often *you* perform the procedure or technique.

Procedures and techniques

	Never	For some cases	For most cases	For every case
1. Local/regional anesthesia:				
a. Subarachnoid block	☐	☐	☐	☐
b. Epidural block	☐	☐	☐	☐
c. Brachial plexus block	☐	☐	☐	☐
d. Transtracheal block	☐	☐	☐	☐
e. Intravenous regional block	☐	☐	☐	☐
f. Caudal block	☐	☐	☐	☐
g. Peribulbar or retrobulbar block	☐	☐	☐	☐
2. Airway management:				
a. Direct visual laryngoscopy	☐	☐	☐	☐
b. Laryngeal mask airway	☐	☐	☐	☐
c. Fiberoptic intubation	☐	☐	☐	☐
d. Endobronchial intubation (double lumen tube)	☐	☐	☐	☐
e. Crycothyrotomy	☐	☐	☐	☐
3. Line placement				
a. Arterial lines	☐	☐	☐	☐
b. Central venous lines	☐	☐	☐	☐
c. PA catheters	☐	☐	☐	☐

Comments

Thank you for your time and input!

Appendix 2

Raw Data

Branch	Yrs of Serv	Yrs of Anes	Grade	Age	Gender	Fclty Size	# CRNAs	# MDAs	# cases
2	5	5	4	42	2	4	10	8	800
2	3	3	3	34	1	5	13	35	500
2	4	4	4	38	2	4	12	26	500
2	3	3	4	41	1	4	14	24	500
2	5	5	5	45	2	2	6	2	300
2	4	4	4	44	2	2	5	2	500
2	5	5	5	40	2	1	2	1	550
2	6	6	5	45	2	1	2	0	550
2	3	3	4	37	2	1	1	1	300
2	4	4	3	34	2	4	11	5	600
2	3	3	3	31	2	3	14	6	500
2	4	4	5	42	1	2	5	2	300
2	3	3	4	39	2	3	5	3	300
2	4	4	5	43	1	4	13	9	100
2	4	4	4	41	2	4	12	1	300
2	3	3	4	42	2	1	2	0	600
2	6	5	4	46	2	1	2	1	480
2	4	4	4	38	2	2	3	1	800
2	3	4		38		4	20	12	
2	3	3	3	33	1	2	6	2	500
2	2	2	3	30	2	2	5	1	350
2	6	6	5	44	2	2	5	1	300
2	3	3	3	43	2	1	2	1	450
2	2	2	4	37	2	3	5	2	1000
2	5	5	5	49	2	3	6	6	100
2	5	5	5	41	2	4	6		
2	7	7	6	49	2	4	6	15	350
2	5	6	5	42	1	4	8	5	400
2		2		35	1	3	7	4	800
2		4		46	1	4	7	4	1000
2	5	5	5	40	2	1	2	1	400
2	4	3	3	37	1	1	2	0	400
2	4	4	4	44	2	4	20	10	350
2	3	3	4	38	1	4	20	15	300
2	6	6	6	47	2	4	25	15	250
1	3	3	4	33	1	4	12	20	300
1	4	4	5	42	1	4	12	20	100
1	3	3	3	39	1	4	9	5	750
1	3	3	3	35	2	4	15	25	400
1	3	3	4	42	1	3	7	7	500
1	3	3	4	42	2	2	5	3	360
1	3	4	4	52	1	4	10	20	600
1	6	6	5	46	2	3			600
1	2	2	4	39	1	3	5	6	200
1	5	5	5	43	1	4	13	30	200
1	3	3	4	38	2	3	6	4	500
1	3	3	3	35	1	2	3	4	350
1		4	4	46	1	3	3	3	

Branch	Yrs of Serv	Yrs of Anes	Grade	Age	Gender	Fclty Size	# CRNAs	# MDAs	# cases
1	5	5	5	40	2	4	12	24	10
1	3	3	4	34	1	3	7	7	300
1	4	4	5	49	2	1	1	1	320
1	3	3	3	37	2	1	2	1	250
1	3	3	4	40	2	1	2	1	400
1	3	3	4	41	2	2	4	4	350
3	3	3	3		1	1	2	0	300
3	3	3	3	40	2	4	8	8	750
3	5	5	5	50	2	3	10	7	450
3	3	3	3	35	2	1	1	0	280
3	4	5	3	36	2	1	3	1	300
3	3	3	4	45	2	2	6	4	372
3	4	4	4	41	1	2	6	4	408
3	4	4	4	41	2	1	2	0	600
3	3	3	3	42	2	1	1	0	500
3	2	2	4	44	2	1	6	4	350
3	2	2	3	43	2	1	6	4	700
3	3	3	3	42	1	1	4	2	500
3	7	7	4	46	2	1	5	3	250
3	4	4	3	40	2	1	2	0	300
3	1	6	5	48	2	3	4	2	800
3	3	3	3	39	2	5	25	25	500
3	5	5	5	48	1	4	21	26	900
3	3	3	4	43	1	1	1	0	150
3	2	2	3	43		1	1	0	450
3	6	6	5	46	1	1	6	3	250
3	3	3	4	38	2	1	2	0	600
3	4	4	4	46	2	1	3	0	400
3	2	2	3	31	1	4		10	
3	4	4	3	37	2	5	19	8	600
3	3	3	3	34	2	3	11	6	500
3	5	5	4	38	1	4	17	8	300
3	2	2	3	31	2	1	4	3	120
3	4	4	4	42	2	2	5	3	960
3	3	3	3	37	2	2	4	4	300
3	2	2	3	35	2	1	3	3	350
3	2	2	4	43	1	4	12	7	700
4	4	6	5	52	1	1	1	0	50
4	5	7	6	59	2	2	3	1	750
4	4	2	3	39	2	3	4	4	300
4	4	4	5	46	1	2	3	1	500
4	2	3	4	44	2	4	9	4	
4	4	4	5	42	2	3	9	4	700
4	2	4	4	39		1	1	1	500

%inf	%child	% adol	%adult	% elder	ASAI	ASAII	ASAIII	ASAIV	ASAV	%Elect	%Emerg
5	20	25	30	20	40	30	20	9	1	97	3
1	2	0.5	96	0.5	50	45	5	0	0	80	20
2	5	5	63	25	35	50	14	1	0	95	5
2	5	7	60	25	35	40	15	10	0		
					40	50	10			75	25
10	10	20	55	5	45	50	5	0	0	95	5
5	10	10	50	25	50	39	10	1	0	90	10
3	3	4	60	30	45	50	5	0		95	5
2	3	10	80	5	40	54	5	1	0	98	2
2	3	3	90	2	60	30	7	3	0	75	25
1	5	5	75	14	50	30	18	1	1	95	5
5	5	5	65	20	40	40	15	3	2	90	10
1	3	3	85	8	25	50	25	0	0	97	3
1	3	1	45	50	10	65	20	5	0	95	5
5	10	5	75	5	75	20	5	0	0	85	15
1	10	10	74	5	30	39	30	1	0	90	10
5	20	10	60	5	60	30	5	5	0	95	5
5	10	15	50	20	60	20	15	4	1	95	5
5	10	10	60	15	10	50	30	10	0	80	20
15	20	15	40	10	30	45	20	5	0	85	15
1	10	5	64	20	33.5	60	6	0.5	0	85	15
5	5	30	35	25	30	50	10	5	5	90	10
1	5	4	80	10	15	60	20	5	0	80	20
5	25	10	50	10	50	29	20	1	0	70	30
10	15	5	60	10	40	40	15	5	0	50	50
2	8	10	50	30	20	40	29	10	1	75	25
5	10	5	35	45	24	20	50	5	1	70	30
10	20	10	50	10	20	60	10	10	0	80	20
20	20	20	20	20	50	23	23	2	2	90	10
5	5	5	80	5	35	60	5	0	0	90	10
1	10	5	84	0	40	58	2	0	0	70	30
5	10	25	45	15	25	40	35	5	0	85	15
2	8	10	60	20	40	40	15	3	2	85	15
10	10	20	45	15	30	47	20	2	1	90	10
0	2	2	66	30	40	40	10	10	0	95	5
0	2.5	2.5	85	10	65	25	8	2	0	95	5
5	10	10	70	5	60	30	7	2	1	70	30
0	1	1	80	18	50	30	15	5	0	95	5
1	4	2	80	3	45	45	9	1	0	70	30
12	8	5	60	15	20	60	10	8	2	95	5
1	4	5	85	5	65	25	8	2	0	90	10
			60	40	5	70	25			90	10
1	5	10	44	40	40	40	20	0	0	80	20
5	5	5	75	10	50	34	15	1	0	85	15
2	13	5	65	15	25	50	20	5	0	90	10
2	8	4	76	10	35	60	4.9	4	0.5	90	10
3	7	0	90	0	50	50	0	0	0	95	5

%inf	%child	% adol	%adult	% elder	ASAI	ASAII	ASAIII	ASAIV	ASAV	%Elect	%Emerg
0	1	1	90	8	80	15	5	0	0	99	1
10	10	5	70	5	70	20	10	0	0	80	20
3	4	3	85	5	30	50	10	9	1	60	40
5	10	5	75	5	40	55	4	1	0	92	8
1	5	5	80	9	40	60	0	0	0	90	10
1	8	10	65	15	40	49	5	5	1	98	2
0	2	5	70	23	39	60	1	0	0	30	70
2	2	2	50	44	15	40	40	4	1	90	10
1	5	15	25	49	5	40	54	1	0	85	15
2	10	10	68	10	50	30	15	5	0	75	25
5	10	5	70	10	40	55	5	0	0	90	10
1	9	10	55	25	41	50	9	0	0	90	10
1	4	2	80	13	30	60	9	1	0	65	35
0	5	5	50	40	40	50	10	0	0	95	5
0	5	5	80	10	20	75	5	0	0	98	2
1	5	10	64	20	15	69	15	1	0	80	20
2	10	20	50	18	20	40	20	15	5		
1	1	1	95	2	60	39	1	0	0	95	5
5	5	5	80	5	40	50	9	1	0	95	5
2	8	10	70	10	20	64	12	2	2	60	40
1	1	2	46	50	5	30	60	5	0	98	2
2	3	5	80	10	50	25	20	4	1	80	20
0	5	5	55	35	20	54	25	1	0	90	10
0	5	5	90	0	60	40	0	0	0	99	1
5	10	10	70	5	20	70	10	0	0	90	10
2	3	3	62	30	30	50	19	1	0	75	25
0	2	15	80	3	25	70	3	2	0	85	15
0	2	15	75	8	80	18	2	0	0	97	3
5	15	10	60	10	10	75	10	5	0	80	20
10	20	10	40	20	34	40	20	5	1	80	20
1	9	5	65	20	10	55	30	5	0	60	40
1	1	8	60	30	50	30	15	5	0	95	5
5	10	10	65	10	75	19	5	1	0	85	15
2	8	10	60	20	40	40	18	2	0	80	20
0	5	5	70	20	25	50	25	0	0	95	5
5	5	5	55	30	35	35	20	10	0	75	25
0	0	0	100	0	75	25	0	0	0	100	0
5	20	0	60	15	40	40	20	0	0	80	20
12.5	25	12.5	25	25	10	10	80	0	0	80	20
5	5	10	75	5	20	70	5	5	0	80	20
5	20	15	40	20	10	50	30	5	5	90	10
5	10	10	50	25	20	50	15	10	5	80	20
1	5	5	77	12	48	30	20	2	0	90	10

preCRNA	preMDA	indMDA	indC&MD	indMDin	indCRNA	intMDpre	intMDinh	intCRNA
2	1	1	1	2	1	1	2	1
2	2	0	0	2	1	0	2	1
2	1	0	1	3	0	1	3	0
2	1	0	1	2	0	1	3	0
2		0	0	2	1	0	2	1
2	1	1	1	1	2	1	1	1
2				2			2	
3	0	0	0	0	3	0	0	3
2	1	0	1	2	1	1	2	1
3	1	0	1	2	1	1	2	1
2	1	1	1	2	1	1	2	1
2	3	1	1	2	1	1	2	1
1	1	1	1	2	1	1	3	1
1	1	0	1	2	1	1	2	1
1	1	0	1	2	1	0	1	1
3	0	0	0	0	3	0	0	3
3	0	0	0	0	3	0	0	2
2	1	0	0	2	1	0	2	1
2				3		3		
2	1	0	1	2	1	1	2	1
2	1	0	1	2	1	1	2	1
2	1	0	2	2	1	1	1	1
3	1	0	1	2	1	1	2	1
2				2			2	
1	2	0	0	1	2	1	1	1
2	1	0	1	3	0	1	3	0
2	0	0	1	2	1	1	2	1
2	1	0	1	2	1	0	2	1
3				3			3	
3	1			3			3	
3	0	0	0	0	3	0	0	3
2	1	0	0	3	0	0	3	0
2	1	0	1	2	1	1	2	1
1	1			2			2	
3	1	0	1	1	0	0	3	0
3	0	0	0	2	1	0	2	1
1	1	1	1	2	1	0	2	1
3	0	0	0	2	1	0	2	1
1	1	0	1	2	1	0	2	1
3	0	0	0	2	1	0	2	1
2	1	0	1	2	1	1	2	1
2	2	0	2	0	0	0	2	0
1	2	1	1	2	1	0	2	1
1	2	0	1	2	0	1	2	0
3	0	0	0	1	2	0	1	2
2	1	0	1	2	1	1	2	1
3				2			2	

preCRNA	preMDA	indMDA	indC&MD	indMDin	indCRNA	intMDpre	intMDinh	intCRNA
2	1	0	0	1	2	0	1	2
3	1	0	0	0	3	0	0	3
3				2			2	
2	0	0	1	0	2	1	0	2
2	1	0	0	1	2	0	1	2
2	2	0	0	3	1	0	3	1
3	0	0	0	0	3	0	0	3
2	1	0	1	3	0	1	3	0
2	1	0	1	2	1	1	2	1
3	0	0	0	0	3	0	0	3
2	1	0	0	2	1	0	2	1
1	1	0	1	2	1	1	2	1
2	1	0	0	2	1	0	1	2
3	0	0	0	0	3	0	0	3
3	0	0	0	0	3	0	0	3
1	2	0	1	2	1	0	2	1
2	1	0	1	1	2	1	1	2
2	1	1	1	2	1	0	2	1
2	1	0	0	2	1	0	2	1
3	0	0	0	0	3	0	0	3
2	1	3	1	1	3	0	1	3
2	1	0	1	2	0	1	3	0
1	1	0	1	3	2	1	3	0
3	0	0	0	0	3	0	0	3
3	0	0	0	0	3	0	0	3
2	1	0	1	2	1	0	1	2
3	0	0	0	0	3	0	0	3
3	0	0	0	0	3	0	0	3
3	1	1	1	2	1	1	2	1
2	1	0	1	2	1	0	2	1
2	1	0	1	2	1	1	2	1
2	1	0	1	1	1	1	2	1
1	1	0	0	2	1	0	1	1
3	0	0	0	1	2	0	1	2
3	0	0	0	2	1	0	2	1
2	1	0	1	2	1	1	2	1
2	1	1	2	1	1	1	1	1
3	0	0	0	0	3	0	0	3
1	1	3	0	1	1	1	1	1
2	1	0	1	2	1	1	1	1
3	0	0	0	0	3	0	0	3
1	2	0	1	2	1	1	2	1
1	2	0	1	2	1	1	2	1
2	1	0	0	0	3	0	0	3

emrMDpre	emrMDinh	emrCRNA	pacMDA	pacCR&MD	pacMDinh	pacCRNA	postCRNA	postMDA
1	2	1	2	1	1	1	2	1
0	2	1	0	0	2	1	3	0
1	3	0	2	1	1	0	2	1
1	3	0	1	1	1	0	3	0
0	2	1	1	1	1	1	2	1
1	1	1	1	1	1	1	2	1
	2				2		2	
0	0	3	0	0	0	3	3	0
0	2	1	1	1	2	1	3	0
1	1	2	1	1	2	1	2	1
1	2	1	1	1	2	1	2	1
1	2	1	1	1	1	1	2	1
1	3	1	3	1	0	1	2	1
1	2	1	1	1	2	1	1	1
0	1	1	1	1	1	1	1	1
0	0	3	0	0	0	3	3	0
0	0	2	0	0	0	2	2	0
0	2	1	1	1	2	1	2	1
	3					3		3
0	2	1	1	1	2	1	2	1
1	2	1	1	0	2	2	3	0
1	2	2	1	2	1	1	2	1
1	2	1	1	2	2	1	2	1
	2				2		2	
1	1	1	1	0	2	1	1	2
1	3	0	1	1	3	0	3	0
1	2	1	1	0	2	1	3	0
1	2	1	0	1	2	1	2	1
	3				3		3	
	3				3		3	
0	0	3	0	0	0	3	3	0
0	3	0	0	0	3	0	3	0
1	2	1	1	0	2	1	2	0
	2				2		2	
1	2	0	1	1	1	0	3	1
0	2	1	1	0	2	1	3	0
0	2	1	1	1	2	1	2	1
0	2	1	1	0	2	1	3	1
0	2	1	2	1	1	1	2	1
0	2	1	1	1	2	1	2	1
1	2	1	0	1	2	1	2	0
0	2	0	2	0	0	0	0	2
1	2	1	1	1	2	1	1	2
1	3	0	0	1	3	0	3	0
0	1	2	0	0	1	2	3	0
0	2	1	1	1	1	1	1	1
	2				2		2	

emrMDpre	emrMDinh	emrCRNA	pacMDA	pacCR&MD	pacMDinh	pacCRNA	postCRNA	postMDA
0	1	2	1	1	1	1	3	0
0	0	3	0	0	0	3	3	0
		3				3	3	
0	0	2	0	1	0	2	3	1
0	1	2	1	1	2	3	3	0
0	3	1	0	0	3	1	3	0
0	0	3	0	0	0	3	3	0
1	3	0	2	1	1	0	2	1
0	2	1	2	1	1	1	2	1
0	0	3	0	0	0	3	3	0
0	2	1	0	0	2	1	2	1
0	2	1	0	1	2	1	1	1
0	1	2	0	0	1	1	2	1
0	0	3	0	0	0	3	3	0
0	0	3	0	0	0	3	3	0
0	2	1	1	1	2	1	3	1
0	1	2	1	1	1	2	2	1
1	2	1	1	1	1	1	3	1
0	2	1	0	0	2	1	3	0
0	0	3	0	0	0	3	3	0
0	1	3	1	1	1	1	3	1
1	2	0	1	1	2	0	2	1
0	3	0	1	0	3	0	2	1
0	0	3	0	0	0	3	3	0
0	0	3	0	0	0	3	3	0
0	2	1	1	1	2	1	2	1
0	0	3	0	0	0	3	3	0
0	0	3	0	0	0	3	3	0
1	2	1	1	1	2	1	2	1
1	2	1	1	2	1	1	3	0
1	2	1	1	0	2	1	3	0
1	2	1	2	1	1	1	2	1
0	1	1	0	0	1	1	3	1
0	1	2	0	0	1	2	3	0
0	2	1	0	0	2	1	2	1
1	2	1	1	1	1	1	1	1
1	1	1	2	1	1	1	3	1
0	0	3	0	0	0	3	3	0
1	1	2	2	1	1	1	2	1
0	1	2	1	1	1	1	2	1
0	0	3	0	0	0	3	3	0
0	2	1	2	1	1	1	2	1
1	2	1	2	0	1	1	1	2
0	0	3	0	0	0	3	3	0

SAB	Epid	Plexus	Transtra	IVregion	Caudal	Peribulb	DVL	LMA	Fiberop	DLT	CRYCTHYR
1	1	1	1	1	1	0	2	1	1	1	0
3	3	3	3	3	2	0	3	3	0	0	0
3	3	3	3	3	3	0	3	3	3	3	0
3	3	3	2	3	2	0	3	3	2	3	
3	3	3	3	3	3	0	3	3	3	1	0
2	2	2	2	3	3	0	2	2	1	1	0
3	3	3	3	3	0	1	3	3	1	1	0
3	3	3	3	3	0	0	3	3	0	0	0
3	3	3	3	3	3	0	3	3	2	0	0
3	3	3	3	3	3	0	3	3	3	3	0
2	2	2	2	2	2	0	2	1	1	2	1
3	2	3	2	3	1	0	3	3	1	1	0
3	3	3	1	3	1	0	3	3	1	1	0
1	1	1	1	1	1	0	1	1	1	1	0
3	3	3	0	3	3	0	3	0	1	3	0
3	3	3	3	3	3	0	3	3	3	3	1
1	1	1	1	1	0	0	2	0	1	1	0
3	3	3	3	3	3	3	3	3	3	3	0
3	3	2	2	3	2	1	3	3	1	3	1
3	3	3	3	3	3	0	3	3	2	2	0
3	3	3	3	3	3	0	3	3	3	3	0
3	3	2	3	3	2	0	3	2	1	1	0
3	3	3	2	3	1	0	3	3	2	1	0
2	2	2	2	2	2	0	2	2	1	1	0
1	1	1	1	1	1	0	2	1	1	1	0
3	3	3	3	3	3	0	3	3	3	3	0
3	3	3	2	3	0	0	3	3	2	3	1
3	3	3	3	3	3	0	3	3	3	3	0
3	3	2	2	3	3	0	3	3	3	3	3
1	1	1	1	1	1	0	2	1	1	1	0
3	3	3	0	3	0	0	3	1	1	0	0
3	3	3	3	3	3	0	3	3	3	3	0
3	3	1	1	3	1	0	3	3	2	3	0
1	1	1	1	1	1	0	2	1	1	1	0
3	3	3	3	0	3	0	3	3	3	0	0
3	3	3	3	3	3	0	3	3	2	2	0
3	3	3	2	3	3	0	3	3	2	3	0
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3	3	3	3	3	3	0	3	3	3	3	0
3	3	3	3	3	3	0	3	3	3	3	0
3	3	1	1	2	1	0	3	3	1	2	0
3	3	3	3	3	0	0	3	3	1	3	0
2	2	2	0	3	2	0	2	3	0	0	0
3	3	3	3	3	3	0	3	2	2	2	2
3	3	3	3	3	3	0	3	3	3	3	1
3	3	3	3	3	3	0	3	3	3	3	0
3	3	3	0	3	3	0	3	3	3	3	0

SAB	Epid	Plexus	Transtra	IVregion	Caudal	Peribulb	DVL	LMA	Fiberop	DLT	CRYCTHYR
2	2	2	1	0	1	0	2	1	1	1	0
1	1	1	0	1	1	0	2	0	1	1	0
3	3	3	3	3	3	0	3	3	3	2	0
1	1	1	0	1	0	0	2	1	1	0	0
3	3	3	3	3	3	0	3	3	3	3	1
3	3	3	3	3	3	0	3	3	0	1	3
3	3	3	0	3	0	0	3	0	0	0	0
3	3	2	1	0	1	0	3	3	1	2	0
1	1	1	1	1	1	0	1	1	1	1	1
1	1	1	0	1	0	0	2	1	0	0	0
3	3	3	3	3	3	0	3	0	1	0	0
3	3	3	2	3	3	0	3	3	3	3	0
1	1	1	1	1	1	0	2	1	1	1	0
1	1	1	0	1	1	0	2	0	1	0	0
1	1	1	0	1	1	0	2	1	1	0	0
3	3	3	2	3	1	0	3	3	1	2	0
1	1	1	1	1	1	0	1	1	1	1	0
3	3	3	1	3	1	0	3	3	1	0	0
3	3	3	3	3	3	0	3	3	3	3	3
1	1	1	1	1	1	0	2	1	1	0	0
1	1	1	0	1	0	0	1	1	1	0	0
2	2	2	2	2	2	1	2	2	2	2	2
2	2	2	2	2	2	0	2	2	2	2	0
1	0	0	0	1	0	0	3	0	0	0	0
3	3	3	3	3	3	0	3	3	3	0	0
1	1	1	1	1	0	1	1	1	1	0	0
3	3	3	3	3	3	3	3	3	3	3	3
1	1	1	1	1	0	0	1	0	1	1	0
2	2	2	2	2	2	0	2	2	1	2	1
3	3	3	1	3	0	2	3	2	1	2	0
3	3	2	3	3	3	0	3	3	3	3	1
3	3	3	3	3	1	0	3	3	1	3	0
3	3	3	2	3	1	0	3	3	2	2	1
3	3	3	0	3	3	0	3	3	3	3	0
3	3	3	3	3	3	0	3	3	3	3	0
1	2	1	0	0	1	0	2	1	1	0	0
3	3	2	2	3	1	0	3	1	1	3	0
0	0	0	0	0	0	0	3	0	0	0	0
3	1	0	0	3	1	0	3	0	1	0	0
2	1	1	1	1	1	0	2	1	1	1	1
3	3	3	3	3	1	0	3	3	2	1	0
3	2	0	0	3	0	0	3	3	1	2	0
3	3	3	3	3	0	0	3	3	3	3	0
3	3	0	0	3	0	0	3	3	2	3	0

Aline	Centvein	PAcaths
1	1	1
3	0	0
3	3	1
3	1	0
3	3	1
1	1	1
3	3	1
0	0	0
3	2	1
2	2	1
2	1	0
3	0	0
2	1	0
1	1	0
1	0	0
2	1	1
1	1	0
3	1	1
3	2	2
3	3	1
1	1	0
2	1	0
3	1	0
1	1	0
1	1	0
3	3	1
3	3	3
3	3	0
3	3	1
1	1	1
1	0	0
3	2	2
3	2	2
1	1	1
3	3	3
3	2	0
3	1	0
1	0	0
3	2	1
3	1	1
1	1	1
3	3	1
1	0	0
3	2	2
3	2	2
3	0	0

Aline	Centvein	PAcaths
3	1	1
1	1	1
1	0	0
3	3	3
1	0	0
3	3	3
3	3	3
3	0	0
2	1	1
2	2	2
1	0	0
3	3	3
2	1	0
1	1	0
1	0	0
1	0	0
2	0	0
1	0	0
1	0	0
3	0	0
0	1	0
1	1	1
2	2	2
2	2	2
0	0	0
0	0	0
1	1	1
3	3	3
1	0	0
2	1	1
3	1	1
3	1	1
3	2	1
3	3	3
3	1	0
3	3	2
1	0	0
3	1	1
0	0	1
0	0	0
1	1	1
3	3	3
3	1	1
2	2	2
3	2	1

Vita

Steven P. Eby was born June 11, 1957, in Lafayette, Louisiana and is a citizen of the United States. He graduated from Lafayette High School, Lafayette, Louisiana, in 1975 and was selected as one of the states Top 100 Scholars by the Louisiana State University Alumni Federation. In 1979, he graduated from Louisiana State University with a Bachelor of Arts in English. After working in the south Louisiana oilfields for several years, he enrolled in the University of Washington, where he earned a Bachelor of Science in Nursing in 1987. In June of 1987, he was commissioned as an officer in the United States Air Force and has served on active duty since July of that year. He has worked in both adult and neonatal ICU positions in a number of Air Force medical facilities. He earned certification in critical care nursing in from the American Association of Critical Care Nurses in 1990 and is an Advanced Cardiac Life Support Course instructor. In 1994, he applied for and received an Air Force Institution of Technology assignment for graduate studies in nurse anesthesia at Virginia Commonwealth University. He and his spouse, Renee' Owen Eby, have two sons, Christopher and David.